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DONATIONS.

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Bulletin de la Société Géològique de France. Tome IX. Feuilles 23—32. 1837 à 1839. Presented by the Society.

Reply to Professor Bischof's Objections to the Chemical Theory of Volcanoes. By Charles Daubeny, M. D. Presented by the Author.

Comptes Rendus Hebdomadaires des Seances de l'Académie des Sciences. Par MM. les Secretaires Perpetuels. Nos. 18—21. Premier Semestre, 1839. Presented by the Academy.

June 24, 1839.

SIR WM. R. HAMILTON, A. M., President, in the Chair.

His Excellency the Lord Lieutenant was present at the meeting.

William Longfield, Esq., was elected a member of the Academy.

It was Resolved,—That the Treasurer be authorized to sell off stock of the Academy to the amount of £400, if so much be thought necessary by Council.

Professor Mac Cullagh presented and described to the Academy an ancient Irish Cross, which formerly belonged to the abbey of Cong, in the province of Connaught. It is a most interesting memorial of the period preceding the English invasion, and shows a very high state of art in the country at the time when it was made, which was the early part of the twelfth century, in the reign of Therdelach Ua Conchovar, (or Turlogh O'Conor,) father of Roderick, the last of the native kings of Ireland. This date is supplied by the Gaelic inscriptions, extremely clear and well cut, which cover the silver edges of the cross, and which, besides giving the names of the king and of contemporary dignitaries of the church, preserve that of the artist himself, who was an Irishman. A Latin inscription informs us that it contains a precious relic—a portion of the wood of the "true cross;" and this circumstance will account for the veneration in which it has been held for ages, though, unfortunately, it was not sufficient to protect it from injury, much of the ornamental work having been removed, and part of the inscriptions torn away. Notwithstanding these depredations, however, it is still a splendid monument of ecclesiastical antiquity.

In the centre of the arms, at their junction with the shaft, there is fixed a cruciform piece of oak, marked with the figure of a cross, and much older, apparently, than the rest of the wood, which is oak also. This piece bears marks of the knife, as if it had been taken for the relic; though it is perhaps too large to be so, and, besides, it does not appear that the true cross was made of oak. Hereabouts, however, the relic certainly was; for the place is surmounted by a very conspicuous crystal of quartz—a mode of exhibiting such things that seems to be alluded to by Chaucer in the Canterbury Tales, where he makes his "Pardoner" say—

> " Then show I forth my longé *crystal stones,*
> Ycramméd full of cloutés and of bones;
> *Relics* they be, as weenen they each one."

The "crystal stone," indeed, in this instance, is not long, but round, being in fact a very thick double-convex lens, with one surface much more convex than the other; but in other cases, as on the *cumdachs* containing the book of St. Moling and the book of Dimma, the crystals are oblong, as described by the poet; and it is supposed that relics are always to be found beneath them.

The shape of the crystal is somewhat remarkable. Thin lenses, such as we have now, were not invented in those days, nor for a long time after; and the present specimen of a thick one, which could be of no use in viewing an object, unless placed in immediate contact with it, is to be classed among the lenticular gems of quartz, or rock crystal, which Dr. Priestly tells us are sometimes to be met with in the cabinets of the curious, and which, he says, are supposed to have belonged to the Druids.

The cross, like that of the "gentle Pardoner" aforesaid, is studded "full of stones," or rather imitations of them, disposed at regular distances along the edges, and elsewhere. The central crystal is surrounded by an elegant ornament in gold; and all the rest of the cross, both before and behind, is richly adorned with an interwoven tracery, of that peculiar kind which the Irish were so fond of. The tracery is of solid gold; the inscribed edging is of silver; and both are separated from the wooden frame by plates of copper; the whole being held together by nails, of which the heads are little heads of animals. The shaft also terminates below, in the double head of an animal, which is large, and very finely executed. The end is hollow, to admit a staff, by which the cross was carried, like the crosier of an archbishop. The height of the shaft is about two feet and a half, and the span of the arms about nineteen inches.

Having made the foregoing observations, suggested by an actual inspection of the cross, Professor Mac Cullagh said that he would leave it to Mr. Petrie to give a more minute description of it, as well as to relate its history, how it was made at Clonmacnoise, and thence migrated to Cong, with many curious particulars which he had discovered respecting it by a comparison of existing documents. Mr. Petrie had been requested by the Academy to draw up a paper on the subject, (see p. 212) ; and it was to be hoped that he would soon comply with their desire.

In presenting the cross to the Academy, Professor Mac Cullagh stated, that his motive for doing so was, by putting it in the possession of a public body, to save it from that shameful process of destruction to which every thing venerable in Ireland has been exposed for centuries, and to contribute, at the same time, to the formation of a national collection, the want of which, he had been told, was regarded by Sir Walter Scott as a disgrace to a country so abounding in valuable remains. He trusted the time was not far distant when that reproach would be no longer merited; when the relics of antiquity, now scattered over the kingdom, would find their way to a place where they could be appreciated, studied, and preserved. He believed, indeed, that there already existed in the public mind a strong disposition in favour of such a plan; a disposition that only required to be awakened into action. For, no sooner had his intention with respect to the cross become known to a few friends, than a subscription was set on foot, to procure, for a similar purpose, the two magnificent *torques* found thirty years ago at Tara. These had travelled to England and back again, and they narrowly escaped being sent out of the country a second time, and for ever. The timely subscription was immediately successful. The torques had been secured for the Academy; they were to be presented in the course of the same evening; and, along with the cross of Cong, they would help to form the nucleus of the future National Museum. With such a beginning, it was not too much to expect a rapid progress; since matters so attractive and important in themselves would naturally tend to draw others around them.

The special thanks of the Academy were voted to Professor Mac Cullagh for his present of the Cross.

Mr. Mallet gave a notice of the present state of the investigation, entrusted by the British Association to Professor Davy and himself, upon the action of air and water, whether fresh or salt, and under various modifications, upon cast and wrought iron. From the press of other papers, Mr. Mallet was obliged to confine himself to a very brief notice respecting a new mode of protection which he proposed for iron, when exposed to air and water.

This method is of the electro-chemical class, and is founded on the fact; that the softer and more carbonaceous cast irons, such as the Scotch and Irish, are in a positive condition with respect to the less carbonaceous irons, such as the Welch, &c., in common use for engineering purposes.

This difference of electrical condition he has found experimentally to be sufficient to enable protectors of the former sort of iron to be applied to the surface of the latter, with the result of largely preventing the corrosion of the electro-negative metal. This was shown by the exhibition of the results of experiments which had been several months in progress.

It was also stated, that while tin increases the corrosion of iron, contrary to the opinion of Sir Humphry Davy, zinc does not seem to possess a protective power wholly permanent, at least in salt water, from the formation on its surface, after a lapse of three years or more, of insoluble crystals of carbonate lime, having the form and hardness of calc spar, which prevent chemical action on the metal.

The Rev. H. Lloyd, V. P., read a paper descriptive of the Magnetical Observatory of Dublin, and of the instruments and modes of observation employed there. After some prefatory remarks on the anomalous movements of the magnetic declination, and on the establishment of magnetical stations which took its rise from their study, the author proceeded to the immediate subject of his communication.

The Magnetical Observatory of Dublin was erected by order of the Board of Trinity College, the funds being supplied from the College chest. The building was commenced in the summer of the year 1837, and was completed in the course of the following year. The structure, which is of the Doric order, is situated in an open space in the gardens attached to the College: its dimensions are forty feet in length, by thirty in depth. It is constructed of Portland stone, the interior stone of the building being the argillaceous limestone (*calpe*) of the valley of Dublin; several specimens of each of these stones had been previously submitted to a rigid examination, and found to be entirely devoid of any effect upon the magnetic needle. The interior walls of the building are studded, for the purpose of maintaining a uniform temperature, as well as to protect from damp. The nails employed in the woodwork are of copper, and the other metallic fastenings (locks, hinges, &c.,) of brass; no iron whatever being used in any part of the building.

The interior is divided into one principal room and two smaller rooms; one of the latter serving as a closet, and the other as a vestibule. The principal room is thirty-six feet in length, by sixteen in breadth; and has projections in its longer sides, which increase the breadth of the central part to twenty feet. This room is lighted by a dome light at top, and by a window at each end. It contains six stone pillars for the support of the instruments: these are imbedded in solid masonry beneath the floor, and the supports of the floor are framed around them, so that they are completely insulated.

The elements on which the determination of the earth's magnetic force is usually based are, the *declination*, the *inclination*, and the *intensity*. If a vertical plane be conceived to pass through the direction of the force, that direction will be determined when its inclination to the horizon is given, as well as the angle which the plane itself forms with the meridian; and if, in addition to these quantities, we likewise know the number which expresses the ratio of the intensity of the force to some established unit, it is manifest that the force is completely determined.

For many purposes, however, and especially in the delicate researches connected with the *variations* of the magnetic force, a different system of elements is preferable. If the intensity be resolved into two portions in the plane of the magnetic meridian, one of them *horizontal* and the other *vertical*, it is manifest that these two components may be substituted for the total intensity and the inclination; while, at the same time, their changes may be determined with far greater precision. The former variables are connected with the latter by the relations

$$\mathrm{X} = \mathrm{R}\cos u, \quad \mathrm{Y} = \mathrm{R}\sin u;$$

in which R denotes the intensity, X and Y its horizontal and vertical components, and u the inclination. It will be easily seen that the *variations* of u and R are expressed in terms of the variations of X and Y by the following formulæ:

$$\delta u = \sin u \cos u \left(\frac{\delta \mathrm{Y}}{\mathrm{Y}} - \frac{\delta \mathrm{X}}{\mathrm{X}}\right);$$

$$\frac{\delta \mathrm{R}}{\mathrm{R}} = \cos^2 u \frac{\delta \mathrm{X}}{\mathrm{X}} + \sin^2 u \frac{\delta \mathrm{Y}}{\mathrm{Y}}.$$

Mr. Lloyd then proceeded to describe the instruments employed in the determination of these elements and their changes.

The magnet of the *declination instrument* is a rectangular bar, fifteen inches long, suspended by parallel silk fibres, and enclosed in a box to protect it from the agitation of the air. In addition to the stirrup, by which the bar is suspended, it is likewise furnished with two sliding pieces, one near each end of the bar. One of these pieces contains an achromatic lens, and the other a finely divided scale of glass; the scale being adjusted to the focus of the lens, it is manifest that the apparatus constitutes a moving collimator, and that its absolute position at any instant, as well as its changes of position from one instant to another, may be read off by a telescope at a distance. The stirrup is so contrived as to enable the observer to invert the bar, and thus, by the mean of the two readings, to determine the point of the scale corresponding to its magnetic axis.

The framework of the instrument consists of two pillars of copper, thirty-five inches in height, firmly screwed to a massive slab of marble. These pillars are connected by two cross pieces of wood—one at the top, and the other seven inches from the bottom. In the centre of the top piece is the suspension apparatus, and a divided circle used in determining the amount of torsion of the thread. A glass tube, between this and the middle of the lower cross-piece, encloses the suspension thread; and a glass cap at top covers the suspension apparatus, and completes the enclosure of the instrument.

The box is cylindrical, and has two apertures opposite to each other. The aperture in front, used for reading, is covered by a circular piece of parallel glass, attached to a rectangular frame of wood which moves in dovetails; the prismatic error of the glass (if any) is corrected by simply reversing the slider in the dovetails. The opposite aperture is used for the purpose of illuminating the scale.

The apparatus is likewise provided with a brass bar (also furnished with a collimator) for the purpose of determining the plane of detorsion of the suspension thread;—a thermometer, the bulb of which enters the box, in order to determine the interior temperature;—and a copper ring, used in checking the vibrations.

The instrument used in determining the *horizontal component* of the magnetic force is a magnet bar suspended by two parallel wires, and maintained, by the torsion of their upper extremities, in a position at right angles to the magnetic meridian. The directive force due to the mode of suspension is known, when we know the weight of the suspended body, the interval of the wires, and their length; and the ratio of this force to the horizontal component of the magnetic force is given, when we know the angle through which the upper extremities of the wires have been turned, in bringing the suspended bar into the perpendicular position. The magnet being thus maintained in its position by the action of two forces, one of which (the torsion force) is constant, while the other (the magnetic force) is variable, it is manifest that its place will vary around its mean position; and that these variations of angle are connected with the variations of the force, so that when the former are given, the latter are known. The variations of the angle are read off, as in the other instrument, by a collimator and divided scale; and the delicacy of the instrument is such, that (with the adjustment of the parts at present in use in the Observatory) we may estimate changes in the horizontal force amounting to $\frac{1}{10000}$th part of the whole.

The larger parts of this apparatus,—the box, the framework, and the support,—are precisely similar to those of the declination instrument. There are, however, several differences in the essential parts of the instrument, arising chiefly from the different nature of the suspension. The collimator is attached to the stirrup, and has a motion in azimuth, an arrangement which is necessary in the adjustments. The suspending wire passes round a small grooved wheel, on the axis of which the stirrup rests by inverted Ys; and the instrument is furnished with a series of such wheels, of different diameters, for the purpose of varying the interval of the wires. This interval is altered, at the upper extremity, by means of two screws (one right handed and the other left handed,) cut in the same cylinder; the wires being lodged in the intervals of the threads, and their distance regulated by means of a micrometer head.

The third instrument is that used in determining the changes in the *vertical component* of the magnetic force. It is a magnet resting on agate planes, by knife edges, and brought to the horizontal position by weights. There is a small cross of wires near each end, and the changes of position of the magnet are read off by a pair of microscopes. From these changes of position, the changes of the vertical force are inferred, when we know the *inclination* at the place of observation, the *azimuth* of the plane in which the needle moves, and the angle which the line connecting the centre of gravity and centre of motion makes with the magnetic axis of the needle. As the determination of this latter constant would require that considerable additions should be made to the apparatus, Mr. Lloyd has preferred to *adjust* the weights so that the angle in question shall be *nothing*. The weights are small brass screws moving in fixed nuts, one on each arm; the axis of one of these screws is *perpendicular* to the magnetic axis of the bar, and its movement consequently produces the desired adjustment: the other screw (the heavier) is *parallel* to the magnetic axis, and serves to adjust the magnet to the horizontal position. Each of these adjustments admits of an easy test.

The supports of the magnet, and of the micrometers, are firmly attached to a massive slab of marble, which is cemented to the stone pillar on which it is placed; and a spiritlevel, attached to the base, serves to indicate any change which may occur in the level of the instrument. The magnet is of course covered with a box, to protect it from the agitation of the air; and the apparatus is furnished with several minor pieces, which are employed in the various adjustments.

In addition to these instruments, which are those in constant use, the Observatory is furnished with an inclination instrument and a pair of needles, made by Gambey; a transit instrument and large theodolite, used chiefly in determining the *absolute* declination; a transit clock and a chronometer; and a complete set of meteorological instruments.

Mr. Lloyd closed his communication with a brief account of the important undertaking in which her Majesty's Government had recently engaged, for the purpose of advancing the knowledge of Terrestrial Magnetism—an undertaking which he characterized as the vastest in its design, as it might also be expected to be the most fruitful in its results, of any which the British, or any other government, had ever engaged in, in behalf of science.

The Secretary read the following communications from George James Knox, Esq., giving an account of his further researches on Fluorine:

1, *On the Insulation of Fluorine.*

"In a paper on the Insulation of Fluorine which the Rev. Thomas Knox and I had the honor of presenting to the Royal Irish Academy in the year 1837, and which was afterwards published in their Transactions, (vol. xviii. p. 127,) we proved that we had obtained fluorine in an insulated state, by shewing its action upon bismuth, palladium, and gold; but being unable, from our mode of experimenting, to determine what the nature of fluorine at ordinary temperatures might be, i. e. whether it be a solid, a liquid, or a gas, we suggested that such information might be obtained from the electrolization of a fluoride, using as the positive electrode some substance with which this energetic principle should not enter into chemical combination.

"Finding that, since the publication of our paper, no person had entered upon this field of investigation, I considered that the ultimate solution of this problem devolved as a point of duty upon myself; under which impression I undertook the following experiments.

"A fluorspar stopper was made to fit the mouth of one of the fluorspar vessels described in our former paper; that part of the stopper within the vessel being made of the form of a semi-cone, the vertex of which reached nearly to the bottom of the vessel. Through the stopper were drilled vertically three small holes, one through its entire length, the other two through one-third of its length. In the first was inserted a platinum wire, to be used as the negative electrode; in one of the two small holes was inserted a thin platinum wire, bound round a piece of charcoal, intended to form the positive electrode; in the other hole I put gold leaf, litmus, or any other substance upon which I wished to try the action of the gas. Matters being so arranged, the fluorspar vessel was about half filled with anhydrous hydrofluoric acid, the chemical purity of which had been previously ascertained. The platinum wire forming the negative electrode was raised a little above the bottom of the stopper, in order to allow the bubbles of hydrogen to rise through the perforation in the stopper, in place of mixing with the fluorine in the vessel; the wires were then placed in contact with the poles of a constant battery of sixty pair of plates, and the action was allowed to continue for the space of two hours; at the end of which time the litmus was found to be reddened, and the gold not acted upon, but a large quantity of subfluoride of iron formed.

"In the next experiment I made use of a piece of charcoal, from which the iron had been removed by boiling it in nitric acid; in this experiment there was no subfluoride of iron formed, but the vessel was found to contain fluosilicic acid gas.

" In a third experiment a piece of charcoal was employed, which had been previously freed from all metallic impurities and from silica, by being first boiled in pure nitric acid, and afterwards in hydrofluoric acid. Employing this purified charcoal as the positive electrode, I obtained no *immediate* action upon the litmus paper; but after the action had continued for two hours, it was found to be completely bleached, while the gold had undergone no sensible action. That the bleaching was not due to the action of the vapour of hydrofluoric acid was ascertained, by leaving litmus paper for several hours in the neck of a platinum retort, from which hydrofluoric acid was distilling.

" The battery was now kept in action for fifteen hours, at the end of which time the vessel being examined, the litmus had disappeared, and the gold leaf showed signs of having been strongly acted upon, having assumed a dark brownish colour, and having gathered itself into little balls, as if it had undergone the action of heat. The platinum wire was acted upon in those parts where it was in contact with the charcoal, but no where else.

" When the platinum wire forming the positive electrode passed through the stopper to the bottom of the vessel, the hydrogen, in place of rising through the perforation in the stopper, as in the former instance, rose now into the receiver, where, upon applying a light, it exploded, showing that it does not enter into combination with fluorine without the aid of heat. The presence of the vapour of hydrofluoric acid in the vessel prevented me from determining by other experiments how far fluorine was a supporter of combustion.

" To determine the colour of the gas, a stopper of fluorspar similar to the former was made to fit one of the transparent fluorspar receivers formerly described. The gas evolved in the receiver appeared colourless.

"As the action of the gas upon glass could not be determined, owing to the presence of the vapour of hydrofluoric acid, I fused in a bent tube of German glass (such as is used in organic analysis) fluoride of lead. The wire holding the charcoal was made to pass through a cork inserted in one end of the tube, the other platinum wire merely dipped into the fused fluoride. On connecting the wires with the battery, strong electrolytic action commenced, bubbles of gas were evolved rapidly at the surface of the charcoal, which, on arriving at the surface of the fused fluoride of lead, acted instantly upon the glass. The litmus paper was not bleached, nor the gold leaf or platinum wire acted upon. Whether fluorine would act upon perfectly dry cold glass remains to be proved.

"*Conclusion.*—Fluorine then, when obtained in an insulated state, is a colourless gas, possessing properties analogous in all respects to those of chlorine; having, like it, strong attractive powers for hydrogen and metals, but inferior to it in negative electrical energy."

2. *Note on a Compound of Fluorine with Selenium.*

"When the vapour of selenium is passed over fluoride of lead fused in the platinum apparatus employed in obtaining the fluorides of carbon and cyanogen, a seleniuret of lead is formed, and crystals similar in form to those of fluoride of carbon are condensed in the cold receiver. These crystals are soluble in strong hydrofluoric acid. They sublime unaltered at a high temperature. They are instantly decomposed by water or acids, in which property they resemble the fluorides of sulphur and phosphorus."

The President read a paper, by the Rev. Dr. Robinson, M.R.I.A., &c., on the recent Employment of Rockets to determine the Difference of Longitudes of Armagh and Dublin, and on the proposed Extension of this Operation to other British Observatories.

In this paper, after alluding to the recommendation of the

British Association at Edinburgh, and reviewing the history of the principal operations of the kind which have been hitherto performed, the author remarks that the Observatory of Armagh is unfavorably situated for comparison by signals with that of Dublin, though the distance is but sixty-eight miles; there being ground about four miles to the south of Armagh from 700 to 1200 feet of height; and a ridge from 600 to 400 feet high, about fourteen miles north of Dublin. Lieutenant Larcom investigated all possible stations, giving for each its distance and azimuth, and the height above its summit to which the signal should be elevated to make it visible from both observatories. His help was of essential importance; and in consequence of the data supplied by him, the station Slieve Gullion was adopted; which is 1893 feet high, and is distant eighteen miles from Armagh and fifty-one from Dublin. At the latter its summit is a few seconds above the boundary of view, but, at the former, so much below that boundary, that a height of 800 feet above the summit would be required to clear it. Rockets were therefore necessary, and on applying for them to the Honourable Board of Ordnance, they were supplied from Woolwich with the utmost liberality.

In the operations alluded to above, the rockets (supplied by the French Goverment) were what is called 2lbs. and carried 8 oz. of powder; a very great number of them did not rise to a sufficient height; and Dr. Robinson thought it unsafe to use any of less dimensions.

The Ordnance also provided tents for the firing party and an escort of police was granted by Lieut.-Colonel M'Gregor for their protection, which however proved quite unnecessary.

On the 13th of May they were dispatched to the mountain, under the orders of Dr. Robinson's eldest son, and established there in a few hours by the kind aid of the Rev. Dr. Campbell, Rector of Forkhill, which removed every difficulty; and though it was very tempestuous, there were fired fourteen rockets on the 14th, thirteen on the 15th, twenty on the 20th, twenty on the 21st, and nine on the 23rd, in all seventy-six. Of these, sixty-three were observed at Armagh, and fifty-three at Dublin, but only forty-two were simultaneous. The explosions were visible to the naked eye at Armagh, and to an ordinary nightglass at Dublin; they were however observed, at the latter, by Sir William Hamilton and Mr. Thompson, his assistant, with the equatorial of five inches aperture, and the dome clock; at the former by Dr. Robinson with the finder of his great equatorial (two inches three-fourths aperture) and its clock, and by Mr. Edmonson, his assistant, with a telescope (3,2 inches aperture) and the transit clock. A third observer also (but one not much practised) observed them with the west equatorial.

The time at each observatory was determined by a list of stars previously selected and reduced by the places of Encke's Jahrbuch, so that it is conceived there can be no uncertainty in the work except what arises from the personal equations of the observers, which Dr. Robinson hopes to determine on his way to Birmingham. The numbers of the stars used on each night are stated, and also the probable errors of transit and rocket observations; and the probable mean of the whole work is inferred to give for the difference of longitudes of the two observatories, $1^m 14^s$, 425, exceeding the result of Mr. Dent's chronometers by 0^s, 035.

The prosecution of these observations was interrupted by the full moon, but the certainty of their result appears sufficient without resuming them. As however there is a mountain in Leitrim where the rockets will be visible at once from Armagh, Dublin, and Mr. Cooper's Observatory of Markree, in Sligo, the determination of the latter apppears sufficiently important to make Dr. Robinson select that station in case of pursuing the matter any further. But it is even more important to cross the Channel. These 2lb.

rockets rose 800 yards; if fired at Plinlimmon, they will be visible at Dublin, and probably even at Oxford; on the other hand, from Knocklaid, near Ballycastle, county Antrim, they could be seen at points on the west coast of Scotland, which see Ben Lomond, and can be joined by powder signals on it with Edinburgh. This however would require a transit instrument to be established, but the object to be effected is so important that Dr. Robinson hopes to accomplish it.

The President concluded his account of his First Series of Researches respecting Vibration, connected with the Theory of Light. The following is an outline of one of the investigations which are contained in the Series referred to.

It is proposed to integrate the system of equations in mixed differences,

$$\mathrm{D}_t^{\,2} \delta x_{g,h} = \Sigma_{\Delta g} \delta \left(\mathrm{R} \,.\, \Delta_g x_{g,h} \right); \qquad (1)$$

in which h is any integer number from 1 to n inclusive; $x_{g,h}$ is independent of t, but $\delta x_{g,h}$ is a function of t and of $x_{g,1}, \ldots x_{g,n}$, the form of which function it is the object of the problem to discover;

$$\mathrm{R} = m_{g+\Delta g}\, \phi\left(\tfrac{1}{2} \Sigma_{(h)1}^{\;\;n} (\Delta_g x_{g,h})^2 \right), \qquad (2)$$

ϕ being any real function of the semi-sum which follows it, and m being any other real function of the index $g + \Delta g$; while g and $g + \Delta g$ represent any integer numbers from negative to positive infinity. The equations to be integrated may also be thus written:

$$\xi''_{g,h,t} = \Sigma_{\Delta g} \left(\mathrm{R}\, \Delta_g \xi_{g,h,t} + \mathrm{R}' \Delta_g x_{g,h} \Sigma_{(h)1}^{\;\;n} \Delta_g x_{g,h} \Delta_g \xi_{g,h,t} \right), \qquad (1)'$$

in which

$$\mathrm{R}' = m_{g+\Delta g}\, \phi'\left(\tfrac{1}{2} \Sigma_{(h)1}^{\;\;n} (\Delta_g x_{g,h})^2 \right); \qquad (2)'$$

the functions to be found by integration are now those of the form $\xi_{g,h,t}$, considered as depending on t and on $x_{g,1}, \ldots x_{g,n}$; their initial values, and initial rates of increase (relatively to t), namely $\xi_{g,h,0}$ and $\xi'_{g,h,0}$, are regarded as arbitrary but given and real functions of $x_{g,1}, \ldots x_{g,n}$; it is also supposed, in order to simplify the question, that all the sums of the forms

$$\left.\begin{array}{c} \Sigma_{\Delta g}\mathrm{R}\left(\Delta_g x_{g,1}\right)^{a_1} \ldots \left(\Delta_g x_{g,n}\right)^{a_n}, \ \Sigma_{\Delta g}\mathrm{R}'\left(\Delta_g x_{g,1}\right)^{a_1} \ldots \\ \left(\Delta_g x_{g,n}\right)^{a_n}, \end{array}\right\} (3)$$

are independent of g, and are $= 0$ when any one of the exponents $a_1, \ldots a_n$ is an odd number. These equations are analogous to, and include, those which M. Cauchy has considered in his memoir on the Dispersion of Light, and may be integrated by a similar analysis.

A particular integral system may in the first place be found by assuming

$$\xi_{g,h,t} = \mathrm{X}_r \mathrm{A}_{h,r} \cos\left(\varepsilon_r + s_r t - \Sigma_{(i)1}^{\ n} u_i x_{g,i}\right); \qquad (4)$$

$$\Sigma_{(h)1}^{\ n} \mathrm{A}_{h,r}^2 = 1; \qquad (5)$$

$$s_r^2 \mathrm{A}_{h,r} = \Sigma_{(i)1}^{\ n} \mathrm{H}_{h,i} \mathrm{A}_{i,r}; \qquad (6)$$

$$\mathrm{H}_{h,h} = \Sigma_{\Delta g}\left(\mathrm{R} + \mathrm{R}'(\Delta_g x_{g,h})^2\right) \text{ vers } \left(\Sigma_{(i)1}^{\ n} u_i \Delta_g x_{g,i}\right), \quad (7)$$

$$\mathrm{H}_{h,i} = \Sigma_{\Delta g} \mathrm{R}' \Delta_g x_{g,h} \Delta_g x_{g,i} \text{ vers } \left(\Sigma_{(i)1}^{\ n} u_i \Delta_g x_{g,i}\right); \quad (7)'$$

the index r being any integer from 1 to n, and being introduced in order to distinguish among themselves the n different (and in general real) systems of values of s^2, and of the $n - 1$ ratios of $\mathrm{A}_1, \ldots \mathrm{A}_h, \ldots \mathrm{A}_n$, which are obtained by resolving the system of the n equations of the form

$$s^2 \text{A}_h = \Sigma_{(i)1}^{\ n} \text{H}_{h,i} \text{A}_i, \qquad (6)'$$

in which, by (7)′,

$$\text{H}_{i,h} = \text{H}_{h,i}. \qquad (7)''$$

It is important to observe, that by the form of these equations (6)′, (which occur in many researches,) we have the relation

$$\Sigma_{(h)1}^{\ n} \text{A}_{h,q} \text{A}_{h,r} = 0, \qquad (5)'$$

if q be different from r; and that, by (5) and (5)′, we have also the relations

$$\Sigma_{(r)1}^{\ n} \text{A}_{h,r}^2 = 1, \qquad (8)$$

$$\Sigma_{(r)1}^{\ n} \text{A}_{h,r} \text{A}_{i,r} = 0. \qquad (8)'$$

In the particular integral (4), we may consider $u_1, \dots u_n$ as arbitrary parameters, of which x_r and ϵ_r are real and arbitrary, while s^2_r and $\text{A}_{h,r}$ are real and determined functions; and hence, by summations relatively to the index r, and integrations relatively to the parameters u_i, employing also the relations (5) (5)′ (8) (8)′, and Fourier's theorem extended to several variables, we deduce this general integral, applying to all arbitrary real values of the initial data:

$$\xi_{g,h,t} = \left(\Pi_{(i)1}^{\ n} \int_{-\infty}^{\infty} du_i\right)\left(\text{E}_{h,t} \cos + \text{F}_{h,t} \sin\right) \Sigma_{(i)1}^{\ n} u_i x_{g,i}; \quad (9)$$

in which

$$\Pi_{(i)1}^{\ n} \int_{-\infty}^{\infty} du_i = \int_{-\infty}^{\infty} du_1 \int_{-\infty}^{\infty} du_2 \dots \int_{-\infty}^{\infty} du_n; \qquad (10)$$

$$\left.\begin{aligned} \text{E}_{h,t} &= \Sigma_{(r)1}^{\ n} \text{A}_{h,r} \left(\text{Y}_r \cos ts_r + \text{Y}'_r s_r^{-1} \sin ts_r\right), \\ \text{F}_{h,t} &= \Sigma_{(r)1}^{\ n} \text{A}_{h,r} \left(\text{Z}_r \cos ts_r + \text{Z}'_r s_r^{-1} \sin ts_r\right); \end{aligned}\right\} \quad (11)$$

$$\left.\begin{aligned} Y_r &= \Sigma_{(h)1}^{\;n} A_{h,r} E_{h,0}, & Y'_r &= \Sigma_{(h)1}^{\;n} A_{h,r} E'_{h,0}, \\ Z_r &= \Sigma_{(h)1}^{\;n} A_{h,r} F_{h,0}, & Z'_r &= \Sigma_{(h)1}^{\;n} A_{h,r} F'_{h,0}; \end{aligned}\right\} \quad (12)$$

$$\left.\begin{aligned} E_{h,0} &= \left(\frac{1}{2\pi}\right)^n \left(\Pi_{(i)1}^{\;n} \int_{-\infty}^{\infty} dx_{g,i}\right) \xi_{g,h,0} \cos\left(\Sigma_{(i)1}^{\;n} u_i x_{g,i}\right), \\ E'_{h,0} &= \left(\frac{1}{2\pi}\right)^n \left(\Pi_{(i)1}^{\;n} \int_{-\infty}^{\infty} dx_{g,i}\right) \xi'_{g,h,0} \cos\left(\Sigma_{(i)1}^{\;n} u_i x_{g,i}\right), \\ F_{h,0} &= \left(\frac{1}{2\pi}\right)^n \left(\Pi_{(i)1}^{\;n} \int_{-\infty}^{\infty} dx_{g,i}\right) \xi_{g,h,0} \sin\left(\Sigma_{(i)1}^{\;n} u_i x_{g,i}\right), \\ F'_{h,0} &= \left(\frac{1}{2\pi}\right)^n \left(\Pi_{(i)1}^{\;n} \int_{-\infty}^{\infty} dx_{g,i}\right) \xi'_{g,h,0} \sin\left(\Sigma_{(i)1}^{\;n} u_i x_{g,i}\right). \end{aligned}\right\} \quad (13)$$

This general solution involves multiple integrals, of the order $2n$; but many particular suppositions, respecting the initial data, conduct to simpler expressions, among which the following appear worthy of remark.

Suppose that having assumed some particular set $u^{\backprime}_1, \ldots u^{\backprime}_n$, of values of the n arbitrary quantities $u_1, \ldots u_n$, we deduce a corresponding set of coefficients $H^{\backprime}_{h,h}$, $H^{\backprime}_{h,i}$, by the formulæ (7) and (7)′, and represent by $s^{\backprime 2}_1$ and by $A^{\backprime}_{1,1}, \ldots A^{\backprime}_{h,1}, \ldots A^{\backprime}_{n,1}$ some one corresponding system of quantities which satisfy the equations

$$\Sigma_{(h)1}^{\;n} A^{\backprime 2}_{h,1} = 1, \qquad (5)^{\backprime}$$

$$s^{\backprime 2}_1 A^{\backprime}_{h,1} = \Sigma_{(i)1}^{\;n} H^{\backprime}_{h,i} A^{\backprime}_{i,1}; \qquad (6)^{\backprime}$$

we shall then have, as a particular integral system, that which is thus denoted:

$$\xi_{g,h,t} = X^{\backprime}_1 A^{\backprime}_{h,1} \cos\left(\varepsilon^{\backprime}_1 + s^{\backprime}_1 t - \Sigma_{(i)1}^{\;n} u^{\backprime}_i x_{g,i}\right); \qquad (4)^{\backprime}$$

$X^{\backprime}_1$ and $\varepsilon^{\backprime}_1$ denoting here any arbitrary real quantities. If therefore we suppose that the initial data $\xi_{g,h,0}$ and $\xi'_{g,h,0}$ are all such as to agree with this particular solution, that is, if we have, for all values of g and h,

$$\xi_{g,h,0} = \mathrm{X}^{\backprime}_1\, \mathrm{A}^{\backprime}_{h,1} \cos\left(\varepsilon^{\backprime}_1 - \Sigma_{(i)1}^{\ n} u^{\backprime}_i x_{g,i}\right), \tag{14}$$

$$\xi'_{g,h,0} = -s^{\backprime}_1 \mathrm{X}^{\backprime}_1 \mathrm{A}^{\backprime}_{h,1} \sin\left(\varepsilon^{\backprime}_1 - \Sigma_{(i)1}^{\ n} u^{\backprime}_i x_{g,i}\right), \tag*{(14)$'$}$$

we see, *à priori*, that the multiple integrations ought to admit of being all effected in finite terms, so as to reduce the general expression (9) to the particular form (4)$^{\backprime}$; an expectation which the calculation, accordingly, *à posteriori*, proves to be correct. An analogous but less simple reduction takes place, when we suppose that the initial equations (14) and (14)$'$ hold good, after their second members have been multiplied by a discontinuous factor such as

$$\tfrac{1}{2}\left(1 - \frac{2}{\pi}\int_0^\infty \frac{\sin\left(k\,\Sigma_{(i)1}^{\ n} u^{\backprime}_i x_{g,i}\right)}{k}\, dk\right), \tag{15}$$

which is $= 1$, or $= \frac{1}{2}$, or $= 0$, according as the sum $\Sigma_{(i)1}^{\ n} u^{\backprime}_i x_{g,i}$ is < 0, or $= 0$, or > 0. It is found that, in this case, the $2n$ successive integrations (required for the general solution) can in part be completely effected, and in the remaining part be reduced to the calculation of a simple definite integral; in such a manner that the expression (9) now reduces itself rigorously to the following:

$$\left.\begin{aligned} \xi_{g,h,t} &= \tfrac{1}{2}\, \mathrm{X}^{\backprime}_1\, \mathrm{A}^{\backprime}_{h,1} \cos\left(\varepsilon^{\backprime}_1 + t s^{\backprime}_1 - \Sigma_{(i)1}^{\ n} u^{\backprime}_i x_{g,i}\right) \\ &\quad + \frac{1}{\pi}\, \mathrm{X}^{\backprime}_1 \int_0^\infty \frac{dk}{k^2 - k^{\backprime 2}} \left(\mathrm{L}_t \cos\varepsilon^{\backprime}_1 + \mathrm{M}_t \sin\varepsilon^{\backprime}_1\right); \end{aligned}\right\} \tag{16}$$

in which

$$\left.\begin{aligned} \mathrm{L}_t &= \mathrm{P}_t\, k^{\backprime} \cos kx - \mathrm{Q}_t\, k \sin kx, \\ \mathrm{M}_t &= \mathrm{P}_t\, k \sin kx + \mathrm{Q}_t\, k^{\backprime} \cos kx, \end{aligned}\right\} \tag{17}$$

$$\left.\begin{aligned} \mathrm{P}_t &= s'_1\ \Sigma_{(r)1}^{\ n} \left(\mathrm{A}_{h,r}\ s_r^{-1} \sin ts_r \cdot \Sigma_{(h)1}^{\ n} \mathrm{A}_{h,r}\ \mathrm{A}'_{h,1}\right), \\ \mathrm{Q}_t &= \Sigma_{(r)1}^{\ n} \left(\mathrm{A}_{h,r} \cos ts_r \cdot \Sigma_{(h)1}^{\ n} \mathrm{A}_{h,r}\ \mathrm{A}'_{h,1}\right), \end{aligned}\right\} \quad (18)$$

$$x = \Sigma_{(i)1}^{\ n} a'_i\, x_{g,i}, \qquad (19)$$

$$k a'_i = u_i,\ k' a'_i = u'_i, \qquad k'^2 = \Sigma_{(i)1}^{\ n} u'^2_i, \qquad (20)$$

and s_r, $\mathrm{A}_{h,r}$ are the same functions as before of $u_1, \ldots u_n$.

A remarkable conclusion may now be drawn from these expressions, by supposing that all the quantities of the form $s_r^{\,2}$ are not only real but positive, so that the functions $\cos ts_r$ and $\sin ts_r$ are periodic. For in this case the functions $\cos (ts_r \pm kx)$ and $\sin (ts_r \pm kx)$ will vary rapidly, and pass often through all their fluctuations of value, between the limits 1 and -1, while k and the other functions of that variable remain almost unchanged, provided that $t \dfrac{ds_r}{dk} \pm x$ is large, and that the denominator $k^2 - k'^2$ is not extremely small. We may therefore in general confine ourselves to the consideration of small values of this denominator; and consequently may put it under the form $2k'(k - k')$, making $k = k'$ in the numerator, except under the periodical signs, and integrating relatively to k between any two limits which include k', for example between $-\infty$ and $+\infty$. And because

$$\Sigma_{(h)1}^{\ n} \mathrm{A}'_{h,r}\, \mathrm{A}'_{h,1} = 1, \text{ or } = 0,$$

according as $r = 1$ or > 1, we may make

$$\mathrm{P}_t = \mathrm{A}'_{h,1} \sin ts_1, \quad \mathrm{Q}_t = \mathrm{A}'_{h,1} \cos ts_1,$$

$$\mathrm{L}_t = k' \mathrm{A}'_{h,1} \sin (ts_1 - kx), \quad \mathrm{M}_t = k' \mathrm{A}'_{h,1} \cos (ts_1 - kx)$$

and

$$\left.\begin{aligned}&\xi_{g,h,t} = \tfrac{1}{2} \mathrm{X}^{\backprime}_1 \mathrm{A}^{\backprime}_{h,1} \\ &\left\{ \cos\left(\varepsilon^{\backprime}_1 + ts^{\backprime}_1 - k^{\backprime}x\right) + \int_{-\infty}^{\infty} dk \, \frac{\sin(\varepsilon^{\backprime}_1 + ts_1 - kx)}{\pi (k - k^{\backprime})} \right\},\end{aligned}\right\} \quad (21)$$

that is, nearly, if x be considerably different from $t\dfrac{ds^{\backprime}_1}{dk^{\backprime}}$,

$$\left.\begin{aligned}&\xi_{g,h,t} = \tfrac{1}{2} \mathrm{X}^{\backprime}_1 \mathrm{A}^{\backprime}_{h,1} \cos(\varepsilon^{\backprime}_1 + ts^{\backprime}_1 - k^{\backprime}x) \\ &\left\{ 1 + \int_{-\infty}^{\infty} \frac{dk}{\pi k} \sin\left(\left(t\frac{ds^{\backprime}_1}{dk^{\backprime}} - x\right) k\right) \right\}.\end{aligned}\right\} \quad (21)'$$

We have therefore the approximate expressions:

$$\xi_{g,h,t} = \mathrm{X}^{\backprime}_1 \mathrm{A}^{\backprime}_{h,1} \cos\left(\varepsilon^{\backprime}_1 + ts^{\backprime}_1 - k^{\backprime}x\right), \text{ if } x < t\frac{ds^{\backprime}_1}{dk^{\backprime}}; \quad (22)$$

and

$$\xi_{g,h,t} = 0, \text{ if } x > t\frac{ds^{\backprime}_1}{dk^{\backprime}}; \quad (22)'$$

we have also nearly, in general,

$$\xi_{g,h,t} = \tfrac{1}{2} \mathrm{X}^{\backprime}_1 \mathrm{A}^{\backprime}_{h,1} \cos\left(\varepsilon^{\backprime}_1 + ts^{\backprime}_1 - k^{\backprime}x\right), \text{ if } x = t\frac{ds^{\backprime}_1}{dk^{\backprime}}; \quad (22)''$$

but the discussion of the case when x is nearly $= t\dfrac{ds^{\backprime}_1}{dk^{\backprime}}$ is too long to be cited here. The formula (22) for $\xi_{g,h,t}$ coincides with the particular integral (4)`; and the condition which it involves with respect to x, expresses the law according to which this particular integral comes to be (nearly) true for greater and greater positive values of x and t, (if $\dfrac{ds^{\backprime}_1}{dk^{\backprime}} > 0$,) after having been true only for negative values of x when t was $= 0$.

In the particular case $n = 3$, the foregoing formulæ have an immediate dynamical application, and correspond to the propagation of vibratory motion through a system of mutually attracting or repelling particles; and they conduct to this remarkable result, that the velocity with which such vibration spreads into those portions of the vibratory medium which were previously undisturbed, is in general different from the velocity of a passage of a given phase from one particle to another within that portion of the medium which is already fully agitated; since we have

$$\textit{velocity of transmission of phase} = \frac{s}{k}, \qquad \text{(A)}$$

but

$$\textit{velocity of propagation of vibratory motion} = \frac{ds}{dk}, \qquad \text{(B)}$$

if the rectangular components of the vibrations themselves be represented by the formulæ

$$\mathrm{XA}_1 \cos(\varepsilon + st - kx), \mathrm{XA}_2 \cos(\varepsilon + st - kx), \mathrm{XA}_3 \cos(\varepsilon + st - kx), \quad \text{(C)}$$

t being the time, and x being the perpendicular distance of the vibrating point from some determined plane.

This result, which is believed to be new, includes as a particular case that which was stated in a former communication to the Academy, on the 11th of February last, (Proceedings, No. 15, page 269,) respecting the propagation of transversal vibration along a row of equal and equidistant particles, of which each attracts the two that are immediately before and behind it; in which particular question s was $= 2a \sin \frac{k}{2}$, and the velocity of propagation of vibration was $= a \cos \frac{k}{2}$. Applied to the theory of light, it appears to show that if the phase of vibration in an ordinary dispersive medium be represented for some one colour by

$$\varepsilon + \frac{2\pi}{\lambda}\left(\frac{t}{\mu} - x\right), \qquad \text{(C)}'$$

so that λ is the length of an undulation for that colour and for that medium, and if it be permitted to represent dispersion by developing the velocity $\frac{1}{\mu}$ of the transmission of phase in a series of the form

$$\frac{1}{\mu} = \mathrm{M}_0 - \mathrm{M}_1\left(\frac{2\pi}{\lambda}\right)^2 + \mathrm{M}_2\left(\frac{2\pi}{\lambda}\right)^4 - \&\mathrm{c}., \qquad (\mathrm{A})'$$

then the *velocity wherewith light of this colour conquers darkness,* in this dispersive medium, by the *spreading of vibration into parts which were not vibrating before, is somewhat less than* $\frac{1}{\mu}$, being represented by this other series

$$\mathrm{M}_0 - 3\mathrm{M}_1\left(\frac{2\pi}{\lambda}\right)^2 + 5\mathrm{M}_2\left(\frac{2\pi}{\lambda}\right)^4 - \&\mathrm{c}. \qquad (\mathrm{B})'$$

For other details of this inquiry it is necessary to refer to the memoir itself, which will be published in the Transactions of the Academy, and will be found to contain many other investigations respecting vibrating systems, with applications to the theory of light.

The two golden torques found at Tara, and exhibited on a former occasion by Mr. Petrie (see PROCEEDINGS, p. 274), having been purchased from Messrs. West by subscription, they were this evening presented to the Academy by Mr. Petrie, in the name of the subscribers.

It was RESOLVED—That the Subscription List be printed* in the PROCEEDINGS; and that the marked thanks of the Academy be given to those gentlemen, who, not being members thereof, joined in the subscription.

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* It will be found under the head of *Donations.*

The President delivered the following Address:

Before the present session closes, as it is now about to do, I am to inform you, that your Council have continued to consider the expediency of awarding any medal or medals, from the resources of the Cunningham Fund, to any of the papers which had been communicated to us for publication, within the last few years, and which had not previously been so distinguished; adopting still the same plan of triennial cycles, and the same principles connected with that plan, which have been announced to you on former occasions; and thinking themselves bound to lean rather to the side of caution, than to that of indulgence, in deliberating on questions of this kind. The award of a medal, in the name of a learned body, is attended with a grave responsibility. It does not indeed pronounce, in the name of the Society, on the rigorous accuracy, or perfect novelty, of the paper which is thus marked out; but it at least offers the peculiar thanks of that Society to the author of that paper, and expresses a desire, on the part of the body, to be connected, to a peculiar degree, in present observation and in future history, with the communication for which the honour is awarded. The withholding of a medal is, for the converse reason, no expression of unfavourable opinion, nor any denial of the existence of a large share of positive merit in the paper or papers which it is thus forborne to distinguish: even when the principle of competition does not happen to come into play, and when no other essay, of the same class and cycle, is adjudged to have superior pretensions. It has, however, appeared to your Council, that they were authorized and bound to award a medal to Mr. Petrie, for his Paper on the History and Antiquities of Tara Hill, printed in the Second Part of the Eighteenth Volume of the Transactions of this Academy; as being, in their opinion, the most important of those which were communicated to us, during the three years ending with December, 1838, in the departments of Polite Literature and Antiquities; and as possessing also such amount of positive merit and interest as to entitle it to this mark of distinction. Having attended the discussions which took place in the Committees on the merits of the various papers, and on Mr. Petrie's Essay in particular, I shall venture now to lay before you, in the briefest possible manner, a few of the grounds of this award ; without attempting to offer a complete statement of those grounds, or anything approaching to a full analysis of the memoir itself, which memoir indeed will very soon be in your hands.

Mr. Petrie's Essay may be considered as consisting of two principal parts : the first containing an account of Events connected with Tara, compiled from Irish manuscripts and illustrative of the History of Ireland; and the second part being devoted to an identification of the existing Remains, including an examination of the various descriptive notices also contained in ancient Irish manuscripts. The documents brought forward, possess a great degree of curiosity and interest; many of them, also, are now for the first time published; and (which is of importance to observe) are given in an entire, unmutilated form ; accompanied with literal translations, and with philological and other notes, adapted to increase their value to the student of the ancient literature and history of Ireland. And what gives to these literary relics a value and an interest perhaps greater than, or at least different from, what might attach to them if considered merely as curious fragments, illustrative of the mode of thinking and feeling in times long passed away, is the circumstance that the accuracy of their topographical descriptions has been tested by recent and careful examination. The resources of the Ordnance Survey have been called in, to check or to confirm, by appeal to existing vestiges, the statements still preserved of the writers of former centuries, respecting the relics of what was even then an ancient and almost forgotten greatness; the time-worn traces have been measured, and compared with those old descriptions; and an agreement has been found, which establishes as well the truly wonderful antiquity of the remains still to be found at Tara, on what was once, and for so many centuries, the royal hill of Ireland, as the correctness and authenticity of documents, which it has been little the fashion to esteem.

It is this clear establishment of the authenticity of what had been commonly thought doubtful, this employment of a manifestly rigorous method of inquiry in what had seemed to many persons a region of fancy and of fable, in a word this evident approach to the character of scientific proof, which has made (I own) a stronger impression on my own mind, and (I believe) on the minds of others too, than even the literary and antiquarian interest of those curious and valuable details (such as the Hymn of Patrick, and the particulars respecting the Lia Fail, or ancient Coronation Stone of Ireland,) brought forward in the present Essay. I shall not venture here to give utterance to any opinion respecting the extent to which the once common and still lingering prejudice against the value and authenticity of Irish Manuscripts, almost against the very existence of any ancient History or Literature of Ireland, may have been removed or exposed before, by the labours of other antiquaries. But it may be allowed me to express a conviction, that it is only by pursuing some such plan as that exemplified in Mr. Petrie's Essay, namely, by a diligent examination of existing Irish Manuscripts, and of existing Irish Remains, and by an unreserved publication of all which may be found in the one and in the other, that full historic certainty can be attained, respecting the ancient state of Ireland. And that if, on the other hand, this diligent search be made, and this full and free publication, they will not fail to produce a clearness and convergence of opinions, among all who attend to these subjects; and will throw such a steady light, not on Irish History alone, but on other cognate histories, as will repay the labour and expense required for such an enterprize.

The Royal Irish Academy has already, from its limited means, contributed much to accomplish this object, or to prepare materials for accomplishing it. By purchase or transcription, we have gradually collected originals, or carefully collated copies, of many of the most valuable manuscripts which are extant, in the ancient Irish language. At a no slight expense, our volumes of Transactions have been and still continue open to receive such fruits of diligent and judicious research, in this department of study, as are contained in the paper on Tara. The sum which, by a recent vote, has been placed at the disposal of the Council, will enable them to push on with vigour the printing and engraving of that other elaborate work of the same author, which was honoured with the award of a medal here some years ago,—the Essay (by Mr. Petrie) on the Round Towers of Ireland. And the liberality of Members concurs with that of extern Subscribers to place, from time to time, upon our table, such splendid donations of ancient Irish Relics, as the Cross and the Torques of this evening.

It is, however, to the resources of the Nation that we must look, to aid us in accomplishing what is truly a national object. As it was long ago pronounced to be a symptom of the health of a State, and an element in its well-being, that all should interest themselves in the weal of each, and that if one member suffer, the whole body should suffer with it; in order that thus whatever injury was offered to a part might be repelled by the energy of the whole, and that every limb might be animated by one pervading vigour: so too it is another fruit and sign of the dignity and happiness of brotherhood, another opposite and contrast to the misery of savage isolation, when not the present only of a nation's life, but the past and future also are regarded with a vivid interest; and, caring for posterity, men care for their ancestors likewise. Each people owes it to the human race, to do what in it lies for preserving its own separate history, and guarding its own annals from decay: and each, according to its power, should cheer and help the rest in their exertions to accomplish this, which is an object common to all. Ireland is rich in records of an ancient civilization; and looks with a just hope to Britain for assistance towards rescuing those records from oblivion, and from the risk of perishing obscurely. Though this Academy possesses many manuscripts, and although many are contained in the Library of our national University, enough has not been done until they have been placed beyond all danger of destruction, and made accessible to students every where, by printing and by publishing them, with notes and with translations, such as can be supplied by some of the few persons who are now versed in the ancient Irish Language. For doing all this well, opportunities can now be had, which the lapse of a generation may almost remove, which the casualties of each year may diminish.

We have had more occasions than one to hear, this evening, of the assistance recently and wisely given by Government to Science. Nor ought (I think) the presence of the representative of our Sovereign and Patron, to restrain me from avowing the hope, in which you all will join, that our desire, long since expressed, for the publication of our Irish Records, may after no long time be granted; and that the State may soon resolve to undertake, or to assist in undertaking, a task for which the materials and the labourers are ready, but of which the expense, though to a Nation trifling, is too great for an Academy to bear.

Of the possibility of accomplishing that task, and of the fruit which may be expected from so doing, if a proof and specimen be sought, they may be found in that Essay, on the History and Antiquities of Tara Hill, for which I now, in the name of this Academy, present this Medal to its Author.

The President then delivered the Gold Medal to George Petrie, Esq., R.H.A., M.R.I.A., and the Academy adjourned to November.

DONATIONS.

The Cross of Cong. Presented by Professor Mac Cullagh.

Bulletins de l'Académie Royale des Sciences et Belles-Lettres de Bruxelles. Presented by the Academy.

Two golden Torques found at Tara. Presented by the Subscribers.

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G. Carr, Esq.	5	0	0
Rev. Dr. M'Donnell, F.T.C.D.	1	1	0
A. Palmer, M.D.	1	1	0

	£	s.	d.
George Pim, Fsq.	1	1	0
George Downes, Esq.	1	1	0
Joseph M. Ferrall, Esq.	1	1	0
J. F. Lynch, Esq.	1	1	0
Jacob Owen, Esq.	1	1	0
Thomas Grubb, Esq.	1	1	0
I. M. D'Olier, Esq.	1	1	0
Charles T. Webber, Esq.	1	1	0
Alexander Boyle, Esq.	1	1	0
Rev. Dr. Horner,	2	2	0
Charles P. Croker, M.D.	1	1	0
*George Roe, Esq.	1	1	0
*Sir Philip Crampton, Bart.	2	0	0
Haliday Bruce, Esq.	1	1	0
*James Magee, Esq.	1	1	0
J. W. Cusack, M.D.	1	1	0
J. A. Nicholson, Esq.	1	1	0
Richard Carmichael, Esq.	2	0	0
*Daniel Nugent, Esq.	1	1	0
*Captain Battersbee, R.E.	1	1	0
George James Knox, Esq.	10	10	0
The Dean of St. Patrick's	5	5	0
*Captain Larcom, R.N.	1	1	0
Thomas Drummond, Esq.	5	5	0
Acheson Lyle, Esq.	1	1	0
D. H. Kelly, Esq.	1	1	0
R. J. Graves, M.D.	1	1	0